# DTIC Current Awareness: August 2003

Blacklock, J. and Zalcman, L. (2003). *The Royal Australian Air Force, Virtual Air Environment, Interim Training Capability (Report No. DSTO-CR-0279).* Edinburgh, Australia: Defence Science and Technology Organisation - Air Operations Division. (DTIC No. ADA415678)

http://handle.dtic.mil/100.2/ada415678

**Abstract:** Currently some Australian Defence personnel train using live assets. This may be prohibitively expensive and some of these assets have very short lifetimes before a major overhaul is required. One case in point is the FA-18 aircraft, which has a lifespan of approximately 5,000 flying hours. DSTO has participated in a series of concept demonstrations showing the potential of synthetic, virtual environment technologies to support operational training. These concept demonstrations showed joint interoperability between the Australian Air Force, Army, and Navy training simulator systems. Other demonstrations carried out between Australian and U.S. Navy training simulators showed virtual interoperability between coalition force training simulators. Further research and development in the DSTO's Advanced Distributed Simulation Laboratory (ADSL) has culminated in the delivery of an IEEE standard, Distributed Interactive Simulation (DIS) virtual environment training system known as the Air Defence Ground Environment Simulator (ADGESIM). An architecture that uses a mix of Commercial-Off-The-Shelf (COTS) products and customized "thin client" applications was adopted. This training system is now being used by FA-18 Air Defence Controllers at RAAF Williamtown for real operational training. This paper describes some of the distributed virtual simulation concepts and technologies used at DSTO's laboratory in Fisherman's Bend, Melbourne, to develop this training system.

Burnette, K. T. (2003). *Automatic Legibility Control (ALC) of Electronic Displays.* Fairborn, OH: Burnette Engineering (DTIC No. ADA415752)

http://handle.dtic.mil/100.2/ada415752

**Abstract:** Pilot legibility requirements are investigated to establish a basis for implementing automatic control over electronic and conventional displays, in day through night aircraft cockpit viewing environments. Applicable legibility test results, published by different experimenters over much of the past century, are examined and analyzed, and comparisons are used to assess their validity as display control criteria. The mathematical model of the human visual system developed provides a basis for the design of display automatic legibility controls, suitable for use in aircraft cockpits, by predicting the pilot's image difference luminance requirements, in the presence of luminance specularly and diffusely

reflected from the display viewing surfaces, and with discrete and distributed glare sources incident on the pilot's eyes. Although this general automatic legibility control (ALC) model and the automatic brightness control (ABC) model, used in the newer Boeing airliners, appear quite different, comparisons show that, when properly implemented, the two models give equivalent results. The advantage of the ALC model is its greater design flexibility, owing to its better-defined physical relationship to vision. Various practical design choices that should be taken into consideration to achieve a successful application of automatic legibility controls are explored in the balance of the report. This includes, for example: methods of achieving compatibility with light reflective, transflective, emissive and transmissive operating mode displays; the relative merits of viable alternatives to the recommended constant legibility control characteristic strategy; interactions between controls for legibility and sensor-video signal conditioning; the type and need for pilot legibility trim controls; and possible response time compensations for the light and dark adaptation of the pilot's eyes during the following glare source exposures.

Caldwell, J. A. (2003). *Short-Term Fatigue Management: A Cross- Study Analysis of the Effects of Dextroamphetamine and Modafinil in Sleep-Deprived Aviators (Report No. AFRL-HE-BR-TR-2003-0059)*. Brooks AFB, TX: Air Force Research Lab - Human Effectiveness Directorate/Biodynamics and Protection Division. (DTIC No. ADA415654)

http://handle.dtic.mil/100.2/ada415654

**Abstract:** Fatigue has been identified as an important operational problem in both military and civilian aviation (Caldwell, 1997; Rosekind et al., 2000). Requirements for extended duty periods. Inconsistent work/rest schedules, multiple-time-zone operations, and night flights combine to potentially degrade performance and alertness in the cockpit. Duty-time limitations traditionally have been relied upon to manage aircrew fatigue; but problems persist as evidenced by the fact that significant fatigue-related mishaps continue to occur. Because of this, it may be worthwhile to consider the limited use of alternative strategies such as stimulants. The data from five placebo-controlled studies (four with dextroamphetamine and one with modafinil) were combined to examine the overall efficacy of stimulants for preserving flight performance, physiological alertness, and subjective vigilance in sleep-deprived pilots. Statistically-significant ($p<.05$) drug main effects and drug-by-time interactions revealed that both compounds maintained flight performance across six maneuvers, attenuated deprivation-related increases in slow-wave electroencephalogram (EEG) activity, and preserved subjective ratings of psychological vigor throughout 34-39 hours of continuous wakefulness, whereas substantial difficulties were observed under placebo. Furthermore, the drug-related effects were remarkably consistent across all of the five studies that were examined. Dextroamphetamine and modafinil are effective for sustaining aviator alertness and performance

(although, some potentially dose-related adverse effects were observed with modafinil). While it may be ill advised to rely upon the long-term use of these or other pharmacological strategies as the sole remedy for fatigue in aviation, stimulants can be counted upon to temporarily mitigate the deleterious effects of fatigue during operations in which no other countermeasures are feasible.

Caldwell, J., Caldwell, J. L., Brown, D, Smythe, N. and Smith, J. (2003). *The Effects of 37 Hours of Continuous Wakefulness on the Physiological Arousal, Cognitive Performance, Self-Reported Mood, and Simulator Flight Performance of F-117A Pilots (Report No. AFRL-HE-BR-TR-2003-0086).* Brooks AFB, TX: Air Force Research Lab - Human Effectiveness Directorate/Biodynamics and Protection Division. (DTIC No. ADA415792)

http://handle.dtic.mil/100.2/ada415792

**Abstract:** Over the past 30 years, fatigue has contributed to a number of Air Force mishaps. Resource cutbacks combined with increased operational tempos, sustained operations, and night fighting could exacerbate the problem. Extended wakefulness and circadian factors can be especially problematic in military aviation where mission demands sometimes necessitate flights as long as 17-44 hours. To effectively counter fatigue in such operations, the effects of this threat must be objectively measured and understood. This study assessed F-117A pilots during a 37-hour period of continuous wakefulness. Although none of the pilots crashed, substantial decrements were found in flight-skills, reaction times, mood, and brain activation as early as after the 26% hour of continuous wakefulness. The greatest flight degradations occurred after 27-33 hours awake, even though many pilots believed their worst performance was earlier. The decrements found in this relatively benign test environment may be more serious under operational conditions unless personnel anticipate the most dangerous times and administer valid fatigue countermeasures.

Campbell, C. H., Throne, M. H., Black, B. A. and Lickteig, C. W. (2003). *Research Observations and Lessons Learned for the Future Combat Systems.* Alexandria, VA: Human Resources Research Organization. (DTIC No. ADA415812)

http://handle.dtic.mil/100.2/ada415812

**Abstract:** This brief summarizes some of the important observations and lessons learned from training research and development conducted by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) over the past 15 years. Its purpose is to assist Future Combat Systems (FCS) designers and developers as they formulate plans for the systems and for the training that will accompany the systems. The topic summaries cover the need for a Master Training Plan,

training development and implementation concerns, training and performance support and system issues, and a few non-training and non-system observations.

DiFazio, A. S. and Sticha, P. J. (2003). *Impact of the Army Continuing Education System (ACES) on Soldier Retention and Performance: Database Development (Report No. FR-02-50).* Alexandria, VA: Human Resources Research Organization. (DTIC No. ADA415293)

http://handle.dtic.mil/100.2/ada415293

**Abstract:** The Army Continuing Education System (ACES) provides education, training, testing, and counseling opportunities to tens of thousands of service members each year. The mission of ACES is to promote lifelong learning opportunities that sharpen the competitive edge of the Army by providing and managing quality educational programs and services. The United States Total Army Personnel Command (PERSCOM), the developers and administrators of ACES, has requested an evaluation to demonstrate the value of ACES to the Total Army. This evaluation consists of two phases. The first phase involved the development of detailed database and evaluation plans. Phase two involves the implementation of the database and evaluation plans. This report describes the data development portion of the phase two effort, which resulted in a comprehensive longitudinal evaluation database. The report presents an overview of the data structure, summarizes the activities by which the database was constructed, and discusses some of the lessons learned in the development process.

Evans, R. K., Scoville, C. R., Ito, M, A. and Mello, R. P. (2003). *Upper Body Fatiguing Exercise and Shooting Performance (Report No. USARIEM-M02-30).* Natick, MA: Army Research Institute of Environmental Medicine. (DTIC No. ADA415824)

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**Abstract:** This study assessed the effect of upper extremity muscle fatigue on shooting performance while in a standing, unsupported firing position. Nine male and three female soldiers fired at targets before and after performing upper extremity exercise to fatigue using both (1) an upper body ergometer and (2) a Military Operations in Urban Terrain obstacle course.

Felton, R. J., Schaab, B. B. and Dressel, J. D. (2003). *Training Requirements of Battle Staff NCOs in Digital Units.* Fort Hood, TX: Lockheed Martin Technology Services Group. (DTIC No. ADA415442)

http://handle.dtic.mil/100.2/ada415442

**Abstract:** The United States Army is transforming to a versatile force with the capabilities, particularly the digital technology, necessary to optimize the flow of information and enhance situational awareness. One vital enlisted position affected by the implementation of these digital technologies and equipment is assigned to Battle Staff Noncommissioned Officers. The Battle Staff Noncommissioned Officer course trains Noncommissioned Officers to be integral members of battle staffs in analog units. The current institutional training does not include instruction on how to use digital technology to leverage performance in Tactical Operations Centers. To determine if the role of the Battle Staff Noncommissioned Officer changed with the inception of digital technology, data were collected from 522Battle Staff Noncommissioned Officers. Findings, based on surveys, observations, and interviews, suggest the need to include digital training within the Battle Staff Noncommissioned Officers Course and the need for system integration training to support the change in the role of the Battle Staff Noncommissioned Officer.

Katz, L. C. and Grubb, G. N. (2003). *Enhancing U.S. Army Aircrew Coordination Training (Report No. ARI-SR-56).* Alexandria, VA: Army Research Institute for the Behavioral and Social Sciences. (DTIC No. ADA415767)

http://handle.dtic.mil/100.2/ada415767

**Abstract:** The US Army defines aircrew coordination as a set of principles, attitudes, procedures, and techniques that transforms individuals into an effective crew. The stated objective of Aircrew Coordination Training (ACT) is to provide aircrews the knowledge, skills and attitudes necessary to increase their mission effectiveness, while decreasing the errors that lead to accidents. ACT and Crew/Cockpit Resource Management (CRM) programs were instituted in the 1980's, first in commercial aviation and later in military aviation, to address adverse mishap rate trends that showed the inability of many aviators to work well together in periods of high stress or workload (Helmreich, Merritt, & Wilhelm, 1999). Minor aircraft malfunctions were resulting in fatal accidents with alarming frequency. While aviators generally displayed excellent knowledge and understanding of aircraft systems, operating procedures, rules and regulations and other technical information, they often displayed a glaring inability to communicate effectively, distribute workload, maintain or regain situational awareness and make sound decisions. Military aviation took note of the success of CRM in the civilian sector and instituted similar training programs.

Mondo, F. J. (2003). *Analysis of Air Force Civil Engineering Strategic Planning (Report No. AFIT/GEE/ENV/03-19).* Wright-Patterson AFB, OH: Air Force Institute of Technology - School of Engineering and Management. (DTIC No. ADA415699)

http://handle.dtic.mil/100.2/ada415699

**Abstract:** Several organizations within the Department of Defense, including the Air Force Civil Engineer, are actively engaged in strategic planning in an effort to create a roadmap for future capabilities and performance. The objective of this research was to analyze the strategic planning process of the Air Force Civil Engineer (CE) as well as the effectiveness of the Civil Engineer Strategic Plan (CESP). The methodology used to complete this analysis was conducted in two distinct phases: 1) process modeling and evaluation, and 2) performance measure evaluation.

NATO Research and Technology Organization. (2003). *Reduction of Military Vehicle Acquisition Time and Cost through Advanced Modeling and Virtual Simulation (Report No. RTO-MP-089).* Neuilly-Sur-Seine, France: NATO Research and Technology Organization. (DTIC No. ADA415759)

http://handle.dtic.mil/100.2/ada415759

**Abstract:** Integrated weapon systems modeling and simulation from concept to operation were treated as essential tool for achieving cost and time reductions which are needed to field new systems. Such tools are being applied to lower the cost and design cycle times from both a design/development and recurring manufacturing perspective. Early identification of problems dramatically reduces costs and improves procurement as well as operations, increasing performance as well as cost effectiveness. The maturing of virtual manufacturing tools led to the review of the various approaches in the NATO framework. Advanced simulation in design, manufacture, and support were treated in four sessions on: Virtual Prototyping and Simulation Tool Integration Qualification by Analysis Design Synthesis Avoiding cost overruns and schedule delays connected to aerodynamic or hydrodynamic performance was treated in three sessions: CFD Modeling Of Non-Linear Phenomena; CFD Validation Procedures; And Error Evaluation Dynamically Coupled CFD.

Pleban, R. J. and Salvetti, J. (2003). *Using Virtual Environments for Conducting Small Unit Dismounted Mission Rehearsals (Report No. ARI-RR-1806).* Alexandria, VA: Army Research Institute for The Behavioral and Social Sciences. (DTIC No. ADA415298)

http://handle.dtic.mil/100.2/ada415298

**Abstract:** This research examined the use of virtual environments as a viable dismounted infantry mission rehearsal tool. Four squads of soldiers individually conducted two missions that involved clearing a two-story building located at an urban operations training site. Two squads rehearsed the mission in a virtual representation of the exact building they would clear at the urban training site. The remaining squads rehearsed in an actual two-story building that was similar to the one they would clear at the urban training site. Squads executed both missions in each environment. Performance differences between the rehearsal groups across the two real world' missions were small to negligible. Group performance differences for flatricides and personnel flagging were negatively affected by simulator constraints. Effectiveness ratings for the two rehearsal modes were clearly dependent on the setting where soldiers rehearsed. The research showed that while virtual environments show promise for this type of training, a number of interface and technology problems must be overcome. Currently, virtual environments do not appear to be as effective as real-world tactical training for improving skills underlying specific small unit tasks or battle drills. However, these environments may be used effectively at selected stages of training to enhance cognitive skills development.

Revilla, A., Christianson, N., Gunderson, E., Ochoa, C. and Zum Brunnen, R. (2003). *Information Operations Vulnerability/Survivability Assessment (IOVSA): Process Structure (Revision A) (Report No. ARL-TR-2993).* White Sands Missile Range, NM: Army Research Lab Survivability/Lethality Analysis Directorate. (DTIC No. ADA415656)

http://handle.dtic.mil/100.2/ada415656

**Abstract:** This document is a revision of the IOVSA methodology formalized in June 2000. The goal of this revised document will be the clarification of the work to be performed for each phase, the requirements, and the expected deliverables. Since this revision will be a living document, it will be updated as appropriate to include lessons learned. The intent of this revision is to facilitate the dialog between the U.S. Army Research Laboratory/Survivability Lethality Analysis Directorate (ARL/SLAD) and the decision-makers (program Executive Offices (PEOs), Program Managers (PMs), evaluators, contractors, etc.) for U.S. Army IT-based systems. As before, the IOVSA process will provide a structured methodology for assessing IT system/System of Systems (SoS) 10 susceptibilities and vulnerabilities. The process will provide flexibility that enables the analyst to customize it for the system/SoS under assessment. Additionally, the IOVSA results will provide critical information to system developers and decision-makers regarding the system's/SoS' 10 susceptibilities and vulnerabilities. Furthermore, enough information will be able to be extracted from the process to evaluate different countermeasure techniques and protection recommendations to determine their feasibility and cost/reward ratio.

Santee, W. R., Blanchard, L. A., Speckman, K. L., Gonzalez, J. A. and Wallace, R. F. (2003). *Load Carriage Model Development and Testing with Field Data (Report No. USARIEM-TN03-3).* Natick, MA: Army Research Institute of Environmental Medicine. (DTIC No. ADA415788)

http://handle.dtic.mil/100.2/ada415788

**Abstract:** The results of a field study of the energy cost of downhill walking and load carriage were used to test a modification of the Pandolf equation (PE) for the prediction of downhill load carriage energy costs. PE is a predictive equation for the energy cost of walking and load carriage on level and uphill terrain. The field study objective was to broaden the database to include slower walking speeds. A new dataset was collected in the field with loads of 0 kg and 27.2 kg at speeds of 0.89 m(x)/s and 1.12 m(x)s- on grades of 0%, -4%, -8.6% and - 10.2%. Oxygen uptake was collected using portable oxygen monitors. To adjust the PE for downhill movement, a correction factor (CF) was derived using data from a prior laboratory study. The final equation is CF =hx(Gx(W+L)xV)/3.5 - ((W+L)x(G+6)2)/W) + (25-v2). The adjusted values, using the M = PE - CF format, fit well for walking at 1.12 m(dot)/s, but at 0.89 m(dot)/s, values were underestimated. Thus, an adjusted PE derived from a laboratory study for walking, and load carriage was valid at 1.12 m(dot)/s for loads up to 27 kg, but was not acceptable at 0.89 m(dot)/s.

Sticha, P. J., Dall, T. A., Handy, K., Espinosa, J. and Hogan, P. F. (2003). *Impact of the Army Continuing Education System (ACES) on Soldier Retention and Performance: Data Analyses (Report No. FR-03-14).* Alexandria, VA: Human Resources Research Organization. (DTIC No. ADA415373)

http://handle.dtic.mil/100.2/ada415373

**Abstract:** This evaluation of the Army Continuing Education System (ACES) considered the following programs: (a) Tuition Assistance (TA); (b) Functional Academic Skills Training (FAST; (c) Military Occupational Specialty Improvement Training (MOSIT); (d) Noncommissioned Officer (NCO) Leader Skill Enhancement Courses; and (e) the Armed Forces Classification Test (AFCT). The assessment of the effectiveness of these programs is based on their ability to enhance soldier performance and increase the prospects of promotion, as well as to reduce attrition and increase reenlistment. The evaluation data came from a longitudinal administrative database that tracked a three-year accession cohort over a six-year period and an NCO database including self-reported participation in ACES programs, promotion information, and observed performance ratings. The analysis was designed to separate effects of participant characteristics from

the effects of the program, and to control for differences in the opportunity and propensity to participate in ACES. Participation in TA and FAST were associated with an increase in the probability of first term reenlistment FAST participation was also associated with lower first-term attrition. Participation in several ACES programs showed positive effects on measures of performance and promotion potential.

Sticha, P. J., DiFazio, A. S., Dall, T. A., Handy, K. and Heggestad, E. D. (2003). *Impact of the Army Continuing Education System (ACES) on Soldier Retention and Performance Phase I: Plan Development (Report No. FR-WATSD-00-49).* Alexandria, VA: Human Resources Research Organization. (DTIC No. ADA415299)

http://handle.dtic.mil/100.2/ada415299

**Abstract:** The U.S. Total Army Personnel Command requested an evaluation of the Army Continuing Education System (ACES) to demonstrate its value in improving enlisted soldier retention and performance. This report describes the planning of the evaluation, including a review of the relevant research literature and the development of evaluation and database development plans. The research literature provides limited coverage of continuing education programs. Results indicate that those who participate in continuing education tend to be better qualified than those who don't. The research suggests that participation in continuing education increases the likelihood of reenlistment and improves performance. The effect remains at a reduced magnitude when other factors are controlled statistically.

Yuengert, L. G. (2003). *CSA Manning Initiative: What Happened to it and Why?* Carlisle Barracks, PA: Army War College. (DTIC No. ADA415795)

http://handle.dtic.mil/100.2/ada415795

**Abstract:** In November 1999, the Chief of Staff of the Army, GEN Shinseki, published a message articulating his desire to fully man the tactical units in the Army by FY02. He directed that Divisional Units and Armored Cavalry Regiments be filled to 100% in the aggregate by the end of FYOO. By the 2nd Quarter of FY01, these units were to be manned to 100% by grade and MOS. Following this; early deploying units were to be filled by the end of FY0l and the remainder of TOE units filled by the end of FY02. The Chief of Staff's vision was universally recognized and applauded as the correct prioritization of the Army's most precious resource, its soldiers. His vision was also recognized skeptically as difficult to achieve. How did the Army do implementing the CSA's Manning Initiative? Was it a successful initiative or a failure? Three years later, it is

possible to review the results and assess the initiative against the backdrop of the events that have occurred. This paper describes the major Army and DoD initiatives and domestic and international events that impacted on the implementation of the CSA's vision. Additionally, it highlights some lessons that can be drawn for strategic leaders who attempt to make major changes in the way that large organizations operate.